

Final Review 2 '0809

Exponential and Logarithmic Functions

- 1) For each problem below, write the equation in both exponential and logarithmic form and solve for x algebraically. Give answers to three decimal places.

a) $\log_7 42 = x$

b) $e^x = 15$

c) $x^4 = 96$

- 2) Use the properties of logarithms to expand the expression as a sum, difference, and/or constant multiple of logarithms. Assume all variables are positive.

$$\ln \frac{x^4 \sqrt{y}}{z^5}$$

- 3) In a group project in learning theory, a mathematical model for the proportion P of correct responses after n trials was found to be

$$P = \frac{0.83}{1 + e^{-0.2n}}$$

- a) Graph the equation and determine any horizontal asymptotes of the problem. Interpret the meaning of the upper asymptote in the context of the problem.
- b) After how many trials will 60% of the responses be correct? Solve algebraically.
- 4) Solve each equation for x algebraically. Be careful of the domain of each function and extraneous solutions.

a) $2e^{5x} = 18$

b) $\log_3 x + \log_3(x - 8) = 2$

c) $\ln(x + 5) = \ln(x - 1) - \ln(x + 1)$

- 5) You invest \$3,000 in an account that pays 6.5% interest compounded monthly.

- a) How much will your investment be worth in 16 years?
- b) How long will it take your investment to double?
- c) If the interest is compounded continuously, how much will it be worth in 16 years?

Inverse Functions

6) Find the inverse of each function below and tell whether the inverse is a function.

a) $4x + 3y = 12$

b) $x^2 - 3y = 5$

Linear Systems and Matrices

7) Use the matrices A and B below to answer each question. Show all your steps and check your answer on the calculator.

$$A = \begin{bmatrix} 4 & 3 \\ 1 & -2 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & -1 \\ 2 & 1 \end{bmatrix}$$

a) $2A - 3B$

b) $A \bullet B$

c) $B \bullet A$

8) Find the point of intersection of each system using substitution or elimination and at least one other method we have studied (elimination, substitution, graphing, matrices etc.). If there is not a single solution, identify the system as dependent or inconsistent and explain why you choose the label you did.

a) $3x + 2y = 19$

$-2x - 4y = -18$

b) $x + 3y = -7$

$y = 5x - 13$

c) $y = 1/4x + 4$

$-x + 4y = 12$

9) Solve the system of equations below by hand using Gaussian Elimination and check with your calculator.

$$4x + y - 3z = 11$$

$$2x - 3y + 2z = 9$$

$$x + y + z = -3$$

Answers to PreCalc Final Review 2

- 1) a) $\log_7 42 = x$, $7^x = 42$, $x = 1.921$
b) $e^x = 15$, $\ln 15 = x$, $x = 2.708$
c) $x^4 = 96$, $\log_x 96 = 4$, $x = 3.130$
- 2) $4\ln(x) + \frac{1}{2}\ln(y) - 5\ln(z)$
- 3) a) Asymptotes at $y = 0$ and $y = 0.83$. The proportion will approach, but not exceed 83% as the number of trials increases.
b) After 5 trials
- 4) a) 0.439
b) $x = 9$ ($x = -1$ is extraneous)
c) No Solution, $x = -2, -3$, but neither are in the domain
- 5) a) \$8,463.86
b) ≈ 128.3 months or ≈ 10.7 years
c) \$8,487.65
- 6) a) $y = 3 - \frac{3}{4}x$ yes it is a function
b) $y = \pm\sqrt{5 + 3x}$ no it is not a function
- 7)
- a) $\begin{bmatrix} 8 & 9 \\ -4 & -7 \end{bmatrix}$ b) $\begin{bmatrix} 6 & -1 \\ -4 & -3 \end{bmatrix}$ c) $\begin{bmatrix} -1 & 2 \\ 9 & 4 \end{bmatrix}$
- 8) a) $x = 5$, $y = 2$
b) $x = 2$, $y = -3$
c) inconsistent
- 9) $x = 2$, $y = -3$, $z = -2$